GREEN SEAL'S GREEN REPORT

JULY 1997

OFFICE FURNITURE

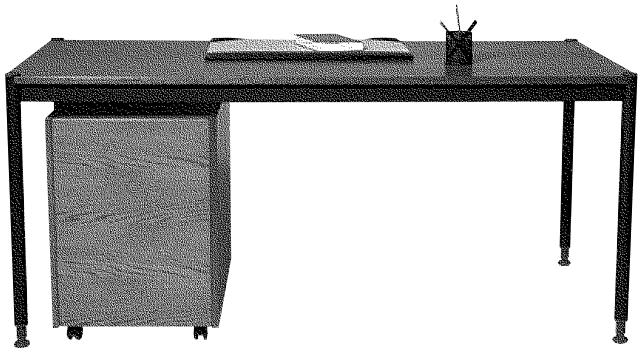
Office furniture is a $10-billion industry, and its impact on the environment–from the cradle to the grave–is significant. It contributes to the depletion of forest and mineral reserves through the extraction of natural resources. Volatile organic compounds (VOCs) can pollute the air and water during the manufacturing process. In addition, when furnishings are installed in the workplace, they may continue to release VOCs and contribute to indoor air pollution. Finally, desks, chairs, cubicle dividers and filing cabinets may wind up in the landfill at the end of their useful lives.

Customers have the power to greatly reduce the impact of office furniture on the environment.

Customers have the power to greatly reduce the impact of office furniture on the environment by choosing environmentally responsible products. Several companies already offer customers choices in the marketplace, and as demand for such products increases, a greater selection at more competitive prices will become available. This report will help customers make better choices for the environment when they're shopping for new or refurbished office furnishings.

In our research, we contacted more than 30 companies that manufacture and refurbish office furniture and asked them to identify the materials they use—from wood and metal to foams and paints—and to provide information on emissions in the manufacturing process and in the office environment as well.

From the information they provided, we were able to identify and recommend eight office furniture products and five office furniture refurbishers. These manufacturers are listed in the enclosed tables. In this issue, we also explain the manufacturing process for different materials to help consumers make informed purchasing decisions.



Environmental Impacts of Office Furniture

■ Wood Products

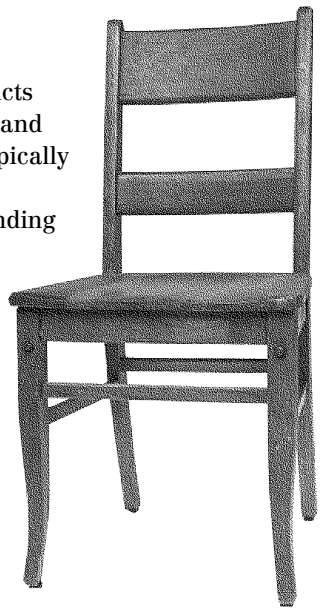
Harvesting wood in a non-sustainable manner contributes to soil erosion, deterioration of watersheds and the loss of biodiversity. It also represents a threat to the economic future of many communities. In addition, loss of tropical rainforests may contribute to global warming.

One way to reduce these negative impacts and to enhance the long-term economic future of communities is to purchase wood from certified, well-managed forests. SmartWood, for example, is a non-profit organization with an innovative certification process and a mission to promote sustainable forestry worldwide (see "SmartWood," page 5).

Scientific Certification Systems also evaluates forests for sustainability and produces environmental report cards. If a forest scores well, the wood or products from it will be certified as "well managed."

The market share of certified wood products in the U.S. is very small, but it is increasing. In Europe, however, certified wood products are relatively easy to find.

As part of their advertising strategy, manufacturers often boast that they use certified woods. It's a good idea to ask for these products because it lets manufacturers and suppliers know that you care about where and how the wood is produced. In addition, some companies may offer both certified and non-certified products. Let them know you prefer the certified wood products.



Conventional fiberboard products such as plywood and particle board typically use a urea-formaldehyde binding agent in the manufacturing process. These products can emit formaldehyde throughout their life cycles. The Environmental Protection Agency (EPA) classifies formaldehyde as a probable human carcinogen.

There are better alternatives to conventional binding agents on the market. For example, phenol-formaldehyde and resorcinol-formaldehyde, though not completely harmless, emit much lower amounts of formaldehyde. An even better choice is to select a fiberboard with formaldehyde-free binding agents.

The Department of Housing and Urban Development regulations for plywood and particle board in manufactured homes sets limits on formaldehyde emissions. All plywood and particle board materials bonded with a resin system, or treated with a paint, varnish or surface finish containing formaldehyde shall not exceed the following emission levels when installed in homes: 0.2 ppm for plywood and 0.3 ppm for particle board.

All manufacturers we surveyed said the plywood and particle board in their products meet all federal emission requirements.

Some office furniture on the market is constructed from alternatives to wood products, including fiberboard made from agricultural waste or recycled paper. If these products incorporate formaldehyde-free binding agents, they represent a good alternative to conventional fiberboard.

Solid wood products, especially if they have been produced from certified, sustainably managed forests, are a good choice, since they don't require any binding agent and consequently don't require formaldehyde.

■ Cushioning Foams

Hydrochlorofluorocarbons (HCFCs) are commonly used as blowing agents for polyurethane foam. HCFCs have replaced chlorofluorocarbons (CFCs), which were banned in the developed world in 1996. Although HCFCs are preferable to CFCs, they still are a factor in ozone depletion and are believed to contribute to global warming. However, there are

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QUESTIONS TO ASK WHEN ASSESSING OFFICE FURNITURE

Does the Product:

- ❑ Use renewable, recyclable or recycled materials?
- ❑ Reduce or eliminate air and water pollution during the manufacturing process?
- ❑ Reduce or eliminate VOC emissions in the office environment?
- ❑ Reduce or eliminate waste by using recyclable or reusable packaging in the shipping process?
- ❑ Contain endangered or exotic woods?
- ❑ Contain heavy metals or toxic coatings?

alternative blowing agents, such as water, isoprene, acetone, pentane and carbon dioxide with limonene and terpene. These products are less harmful to the environment.

■ **Metal Coating**

Metal plating produces a bright, durable and corrosion-resistant finish for metal furniture. A common plating process uses hexavalent chromium (CrVI) with a copper/nickel-plated undercoat. Releases of heavy metals-such as chromium and nickel-and cyanide compounds from electroplating processes are of environmental concern because of their toxicity. Hexavalent chromium and nickel dust are both classified by the EPA as human carcinogens. If metal plating is required for a piece of office furniture, tin-cobalt alloy, nickel alloy or trivalent chromium (CrIII) are recommended over hexavalent chromium plating.

It is relatively simple to design office furniture that does not require metal plating. For example, powder coating is a dry finishing process using finely ground pigment particles and resin which are electrostatically charged and sprayed onto a part to be coated. This is an excellent alternative since it does not involve the use of heavy metals, and there are no VOC emissions. It is also possible to design uncoated metal furniture or to use water-based, low-VOC metal paints.

■ **Adhesives**

Adhesives can cause VOC emissions during manufacturing and later contribute to indoor air pollution. Many of the manufacturers surveyed have switched to adhesives that have no, or very low, quantities of VOCs. These include hot-melt glue and double-sided tape. For some processes, such as gluing a plastic laminate to a fiberboard surface, a solvent-based adhesive is still required. The proposed Green Seal standard for adhesives requires that VOC content not exceed 20 grams per liter.

■ **Paints and Finishes**

Paints and finishes can cause air-polluting VOC emissions as they are applied. In addition, over the lifetime of the furniture these coatings may continue to emit VOCs, contributing to indoor air pollution. Most of the manufacturers surveyed have converted to finishes with no or low levels of VOCs.

However, our survey indicated that many manufacturers are not satisfied with the performance of VOC-free top coating for wood surfaces, so most manufacturers still use solvent-based top coats. Other finishes that produce low emissions of VOCs include a two-component, catalyzed coating that uses a polyester or polyurethane base, supercritical carbon dioxide/solvent-based finish and a coating that uses ultra-violet light as a curing agent.

■ **Reusability, Recyclability and Useful Life**

In general, products with a long useful life—the length of time they are in service—are better choices environmentally than products with a short life. They do not need to be refurbished as often or thrown away as soon, thus reducing demand for raw materials from the start and waste at the end of the product's life.

Refurbishing furniture is an excellent way to extend the useful life of a product. In fact, most products can be refurbished and reused, thus reducing the amount of material sent to the landfill. Refurbishing is a growing industry with approximately $1 billion in sales per year.

Refurbished furniture costs 25 to 70 percent less than comparable new furniture. It is virtually indistinguishable from new furniture and has a similar useful life. And when it does become worn it can be refurbished again. Typically, refurbishing firms replace worn fabric, refinish metal and wood surfaces and relaminate work surfaces. You may be able to find a local refurbisher in the Yellow Pages. Or you can contact the Office Furniture Recycler's Forum (see "Additional Sources of Information," page 6).

One final consideration is recyclability. Products should be easy to disassemble and should not contain co-injected plastics-that is, materials that contain two types of plastic or a plastic and a fiber-because this makes recycling difficult.

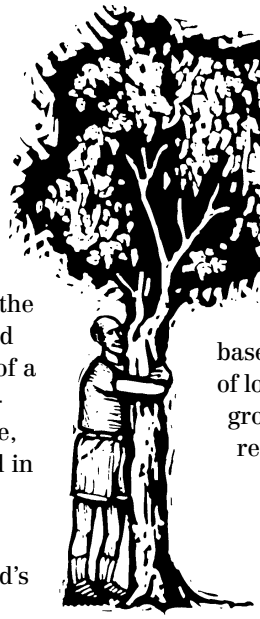
What's Out There

Larger manufacturers offer hundreds of choices, from wool or ramie fabric for office chairs, to water-based paints. Customers can select from products containing recycled content and low- or no-VOC finishes. Some smaller manufacturers offer products made from recovered wood or from agricultural fiberboard.

In our research, we contacted 20 leading U.S. manufacturers of office furniture, 10 U.S. refurbishers of office furniture and four smaller office furniture manufacturers. Specifically, we asked them to identify the materials they use in their office furniture, to assess the recyclability and useful life of the furniture and to provide emissions information. The results of our survey are summarized in the tables below and to the right.

SmartWood

This independent, non-profit forest-management institution monitors and assesses commercial forestry companies, promotes local community economic development and educates the public about sustainable forestry practices around the world. Certified harvesters earn the right to use the distinctive SmartWood seal, with the image of a tree frog and a cross-section of a felled tree, on their products and in their promotional material.



To meet SmartWood's certification criteria:

(1) all forestry operations must be protective of the environment, for example by promoting watershed stability and conservation of biological resources;

(2) planning and implementation of programs must incorporate sustained-yield production for all forest products based on an understanding of local forest ecology grounded in documented research; and

(3) all activities should have a positive impact on the well-being of local communities.

Recommended Office Furniture Refurbishers

MANUFACTURER	PRODUCT(S)	WASTE REDUCTION MEASURES[1]	RECYCLED/RECYCLABLE	AIR POLLUTION	WHERE MADE
Davies Office Refurbishing (518) 449-2040	Panel systems[2], seating, work surfaces	Fabric is recycled. Furniture exchange program.	Guilford–Recycle Line fabric containing 90% recycled material is available.	Water-based and powder coat finishes available.	Albany, NY
Recondition Systems (800) 280-5000	Panel systems[2]	Fabric and aluminum are recycled.	Ecodeme fabric containing 45% recycled material is available.	Water-based finishes are available.	Tempe, AZ
B & H Furniture Systems (817) 430-8345	Panel systems[2], seating, tables	Aluminum, steel and acrylic are recycled.	Fabrics containing up to 80% recycled fiber are available.		Double Oak, TX
Contract Network (214) 340-6400	Panel systems[2], seating	Fabric used as packaging material. Steel, cardboard, paper are recycled.		Water-based finishes are available.	Dallas, TX
Open Plan Systems (804) 228-5604	Panel systems[2]	Metal parts are recycled.	Ecodeme fabric containing 45% recycled material is available.	Powder coating is available.	Richmond, VA

[1] This typically refers to components of the furniture removed so that the product can be refurbished.

[2] Panel systems are the dividers that separate cubicles in the office environment.

Recommended Office Furniture Products

MANUFACTURER	PRODUCT(S)	WASTE MINIMIZATION	NONTOXIC/ ALLERGENIC[1]	AIR POLLUTION	RENEWABLE/ SUSTAINABLY HARVESTED[2]
Studio eg. (510) 763-8812	Systems furniture	Panels–Homasote (100 % recycled newsprint); Tabletops and shelves–Medite II (recycled wood fiber and some PC material); Table legs–recycled cardboard; Edging, Leg bottoms–recycled PVC rubber.	Fiberboards contain no formaldehyde. Catalyzed top coat has low VOC emissions.		SCS[3] certified maple or cherry veneers are also available.
Steelcase (800) 227-2960	Protege chair	Designed to minimize material use, easy to disassemble and recycle, does not contain co-injected[4] products, designed to be shipped uncartoned.	Water-based adhesives. Powder coat finish.	Foam cushions are formed using water-blown foams and water-based release agents.	
Steelcase (800) 227-2960	William McDonough Collection fabrics available	The wool/ramie fabric is biodegradable. Manufacturer recycles all scrap, used as ground cover by local farmers.	Dyes contain no carcinogenic or toxic chemicals or chemicals that bioaccumulate.		
Knoll (215) 679-7991	Parachute Chair	The arm supports are produced from 100% post-consumer PET plastic (soda bottles) and are recyclable. The base contains 100% post-industrial nylon waste from carpet industry.			
Knoll (215) 679-7991	Gehry line of maple furniture				SCS[3]-certified wood from Menomie Tribal Enterprise in Neopit WI.
Good Wood Computer Products (603) 756-4245	Computer stands and other office furniture[5]				SmartWood-certified wood products.
Haworth Inc. (616) 393-3000	Encore Fabric available	100 % recycled polyester, dyed in energy efficient manner.			
Miller SQA (800) 253-2733	Avian Chair	Completely recyclable, material designed to be easily dis-assembled. Minimal amount of material used in design of chair.			

[1] Manufacturers had representative products tested for emissions if they had the potential to emit formaldehyde or VOCs and they all met the federal standards.

[2] The life span of products varies by product and use. Warranties typically vary from 1-10 years depending on the product and the manufacturer.

[3] Scientific Certification Systems.

[4] Co-injected materials are, for example, a plastic and a fiber molded together. These co-injected materials are typically difficult to recycle.

[5] They will manufacture office furniture from certified wood if the volume ordered is sufficient.

Making the Right Choice

If possible, purchase refurbished office furniture instead of new furniture. Ideally, you should select refurbished office furniture that uses recycled materials and low- or no-VOC coatings. Choose a product that uses VOC-free adhesives. There are still a few applications, however, for which VOC-free adhesives do not perform well. Also, when you place an order, request the use of returnable, reusable or minimal packaging.

The following recommendations are for choosing specific materials:

■ **Metal Office Furniture: Desks and Filing Systems**

Choose products with less toxic coatings. A good choice for a metal finish is powder coating, which produces no VOC emissions. Avoid products that use metal plating as a coating, especially chromium VI.

Select products that contain recycled material. Most of the companies surveyed said that their steel contains recycled content, but products produced overseas may contain less recycled material.

Surveys indicate that if demand increased for environmentally responsible products, manufacturers would produce more.

■ **Wood Office Furniture: Desks, Chairs, Shelving and Cabinets**

Select wood or fiberboard products that are made from renewable or sustainably harvested material. Avoid choosing tropical hardwoods or endangered woods, and select domestic wood over exotic woods.

Choose furniture with low or no formaldehyde emissions. When possible, select either formaldehyde-free fiberboard or solid wood products. If you select a wood fiberboard, avoid products that use a urea-formaldehyde glue. A phenol-formaldehyde glue is preferable.

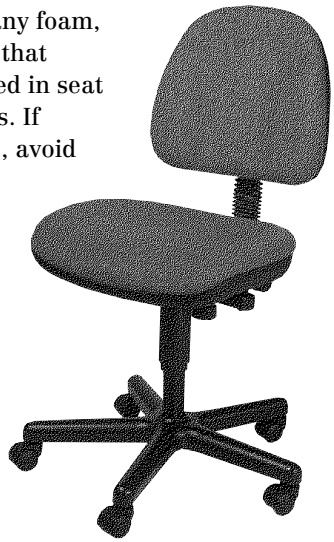
When considering furniture with wood veneer, choose one thick enough to be refinished. The Canadian Environmental Choice Program recommends a minimum veneer thickness of 1/28" (0.9 mm).

Select a VOC-free stain and a low-VOC topcoat.

■ **Upholstered Products: Chairs and Cubicles**

The modern office, with its modular design and open spaces, often uses upholstered panels to separate work spaces. Consider the environmental impact of fabrics for these dividers as well as for the chairs you choose. For seating or cubicle panels, request fabric made from recycled, recyclable, reusable or biodegradable material. Fabrics should be dyed using efficient processes, such as solution dying. The dyes should have low toxicity.

Ask what type of foam-blowing agent is used to create any foam, such as that contained in seat cushions. If possible, avoid foams that use HCFCs as blowing agents.



ADDITIONAL SOURCES OF INFORMATION

Office Furniture Recycler's Forum
301 N. Fairfax Street
Alexandria, VA 22314-2696
(800) 542-6672
http://www.recyclefurn.org/

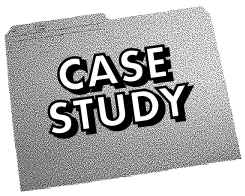
SmartWood Program
Rainforest Alliance
65 Blecker Street, 6th Floor
New York, NY 10012
(212) 677-1900
http://www.rainforest-alliance.org/swr5.html

Canadian Environmental Choice Program
Environmental Specifications for Office Furniture
http://www.ec.gc.ca/gog/procure/envspecof/

NRDC's Washington, D.C. Eco-Office
http://www.igc.org/nrdc/nrdcpro/dcofc/dcofcch1.html

Good Wood Alliance
http://www.web.net/~philipw/menu.html

NATURAL RESOURCES DEFENSE COUNCIL'S ECO-OFFICE



In June 1996, the Natural Resources Defense Council (NRDC) staff in Washington, D.C., moved into their new Eco-Office. In addition to using lighting, appliances and flooring that reduce energy costs and soften the environmental impact, they also chose office furniture with the environment in mind.

All shelving and counter-top foundations were made from alternatives to conventional fiberboard products, plywood and particle board. Wheatboard and other alternative fiberboards such as Gridcore and Medite II, unlike traditional materials, do not emit formaldehyde, so they improve indoor air quality. These products are produced from more sustainable sources, such as recycled wood fiber and agricultural waste. These alternative fiberboards have another advantage: They are stronger than conventional particle board.

For now, none of the large stock cabinet manufacturers uses any alternative fiberboard in their products on a regular basis; therefore, additional labor was required to build custom cabinets, adding to installation costs. However, there is no reason that cabinets made from alternative materials should ultimately cost more.

Consider Wheatboard, for example. This fiberboard is made from an abundant, renewable agricultural byproduct: straw that normally is wasted when wheat is harvested. The material is compacted into a sturdy fiberboard that is cheaper than conventional wood particle board.

For its waiting areas and conference rooms, NRDC also commissioned solid-wood furniture made from sustainably harvested wood.

Fabrics for the furniture cushions were made from biodegradable wool and ramie.

The NRDC selected Environ (Phenix Bio-Composites) products for its countertops and shelving. This synthetic material looks a bit like marble and has the feel of plastic but is made from newsprint, soybean flour, a color additive and proprietary adhesives.

Overall, this innovative project added about $4.90 per square foot to the cost of newly constructed office space. However, this figure is inflated due to the pioneering environmental design services associated with a large-scale project done for the first time. Furthermore, some of the additional costs associated with this design will be recouped in energy savings. As demand for many of the products NRDC selected increases, costs will decline.

FIBERBOARD PRODUCTS USED IN NRDC'S ECO-OFFICE

PRODUCT	COMPANY	COMPONENTS	GLUE
Wheatboard	PrimeBoard (701) 642-1152	Agricultural waste.	Formaldehyde-free polymeric resin.
Gridcore	Gridcore Systems International (214) 265-8494	100%post-consumer paper.	Water-based adhesive, formaldehyde free.
Medite II	Medite Corporation (800) 676-3339	Recycled wood fiber & some PC content.	Proprietary, but formaldehyde free.

Manufacturers Minimize Waste and Maximize Profits

In recent years, many of the larger office-furniture manufacturers have tried to produce more environmentally responsible products. Most of the surveyed firms use efficient packaging methods and packing made from recycled material. They have also been working to reduce formaldehyde emissions from wood products and VOC emissions from finishes and adhesives. Some of the larger manufacturers have worked with state pollution-prevention programs to reduce waste or to find uses for waste. Their efforts have reaped financial rewards: These companies have saved money by designing more environmentally responsible products. Here are a few of the innovative solutions some companies have found to minimize waste.

Steelcase Inc. instituted a buy-back program that encourages reuse of office furniture. The company also ships 50 percent of its products uncartoned, thereby reducing packaging waste.

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Minimize Waste, Maximize Profits
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HON Industries produces pelletized fuel for stoves from scrap wood material generated during its manufacturing processes. This diverts 6,000 tons of wood byproduct each year from the landfill.

Haworth Inc. offers water-blown foams and powder-coated metal finishes. These processes minimize air-pollution emissions and reduce ozone depletion and greenhouse gasses.

The Knoll Group switched from solvent to powder coating for metal finishes. It also uses hot-melt glues in several of their processes instead of VOC-containing adhesives. And it ships its Bulldog line of products in packaging that can be reused.

Allsteel Inc. uses 40 to 60 percent recycled aluminum in its seating products.

MOVING RIGHT ALONG . . .

Effective July 1, 1997,
Green Seal's new address becomes:

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